Technologies to enable cost-effective long duration energy storage

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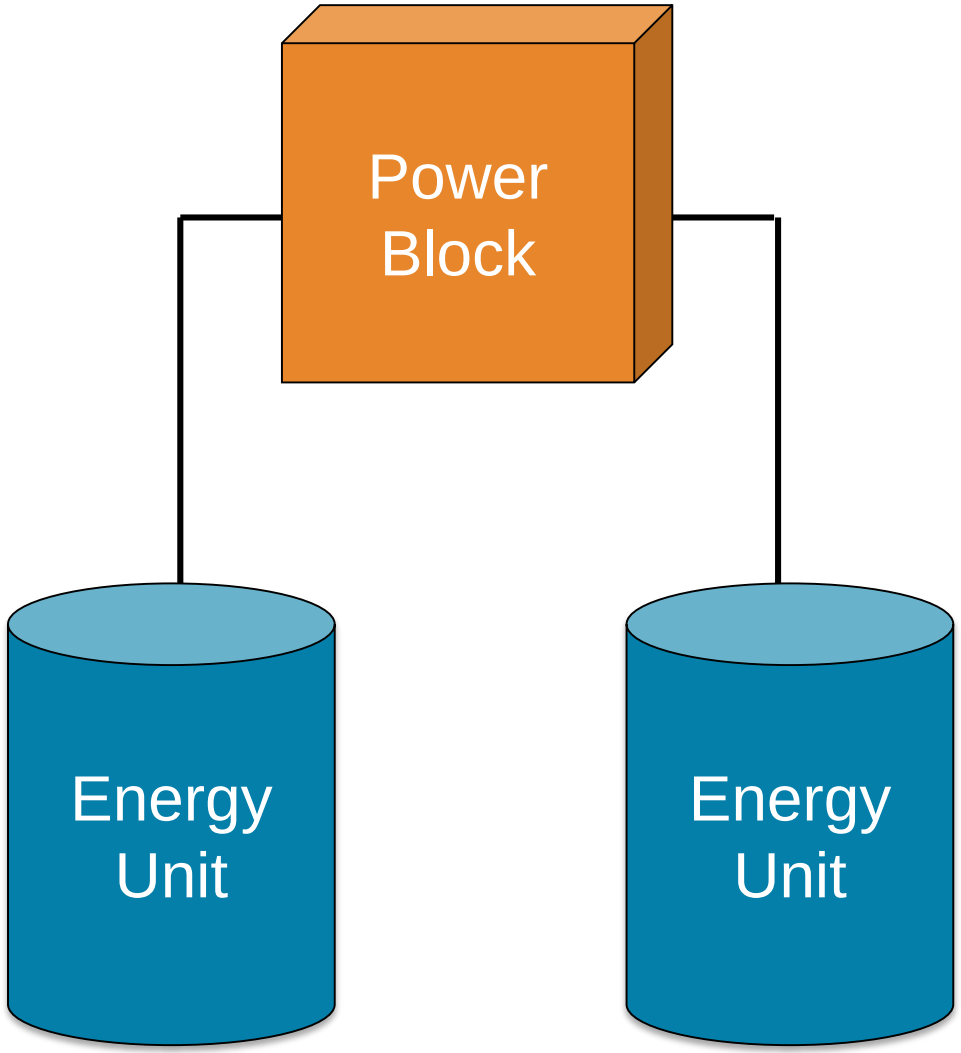
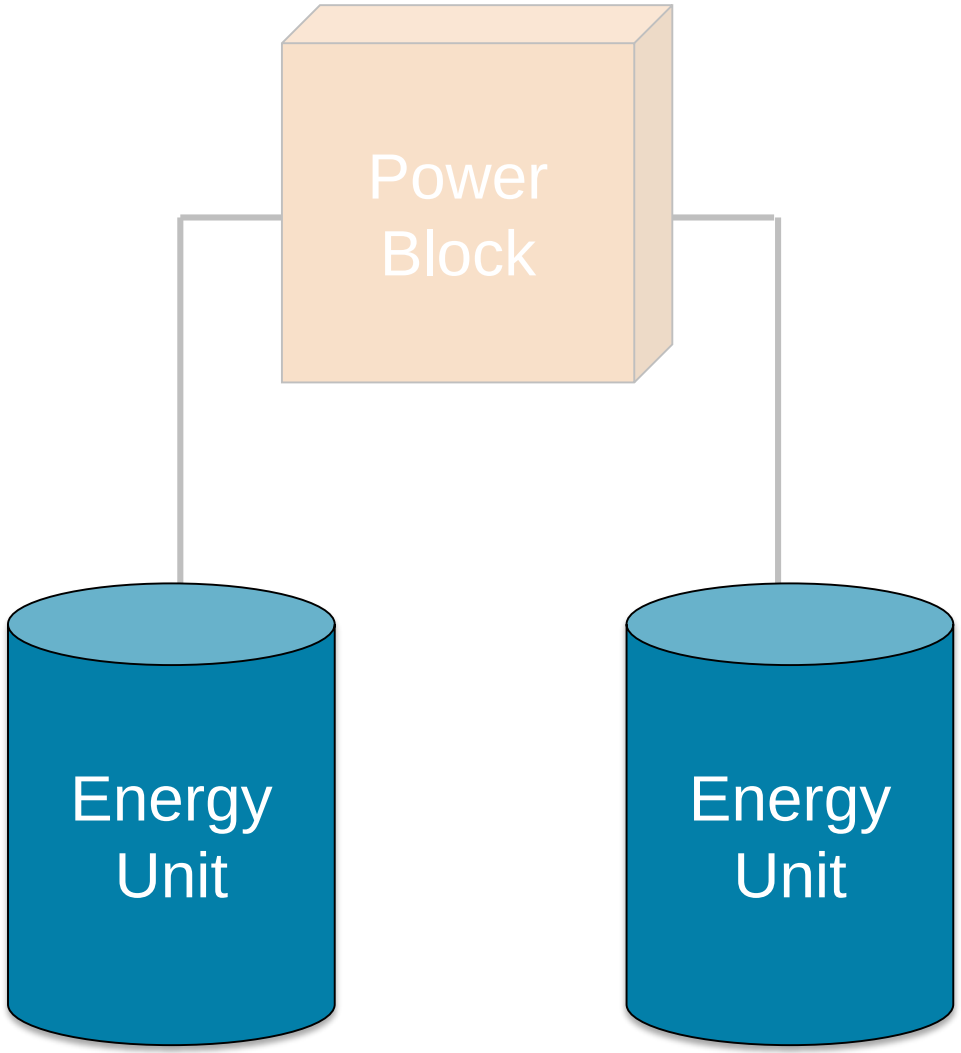
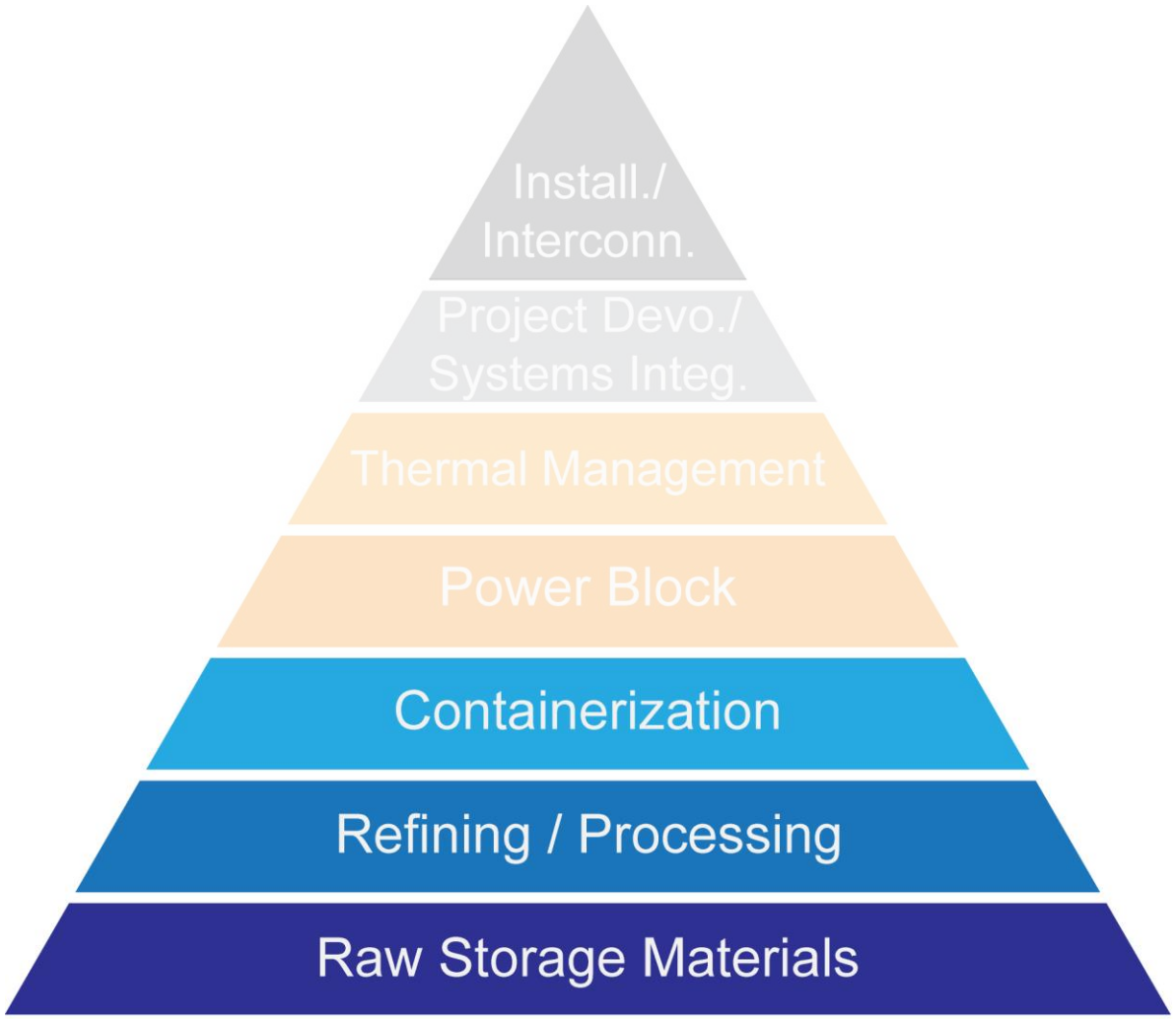
Components of energy storage

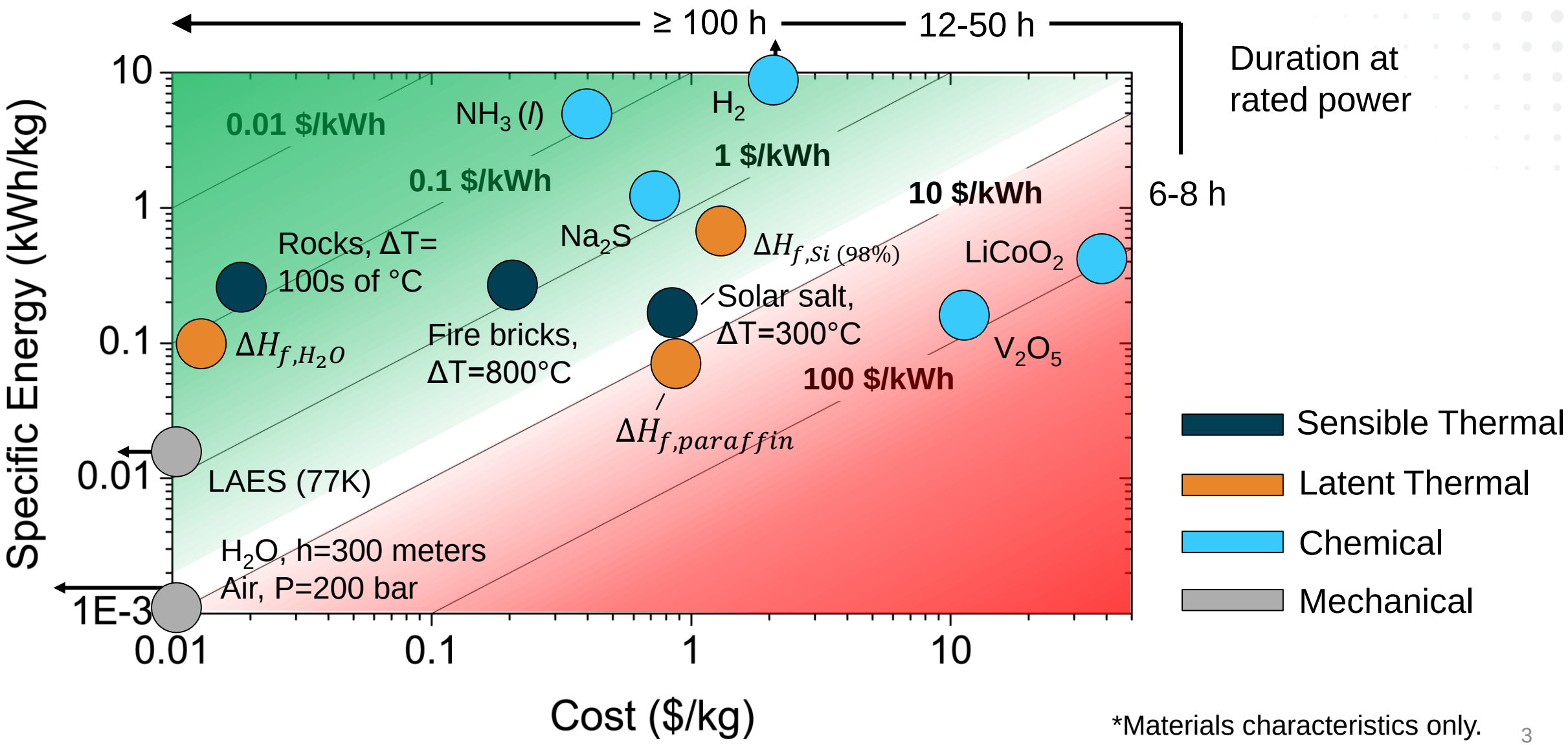


Components of energy storage: Energy



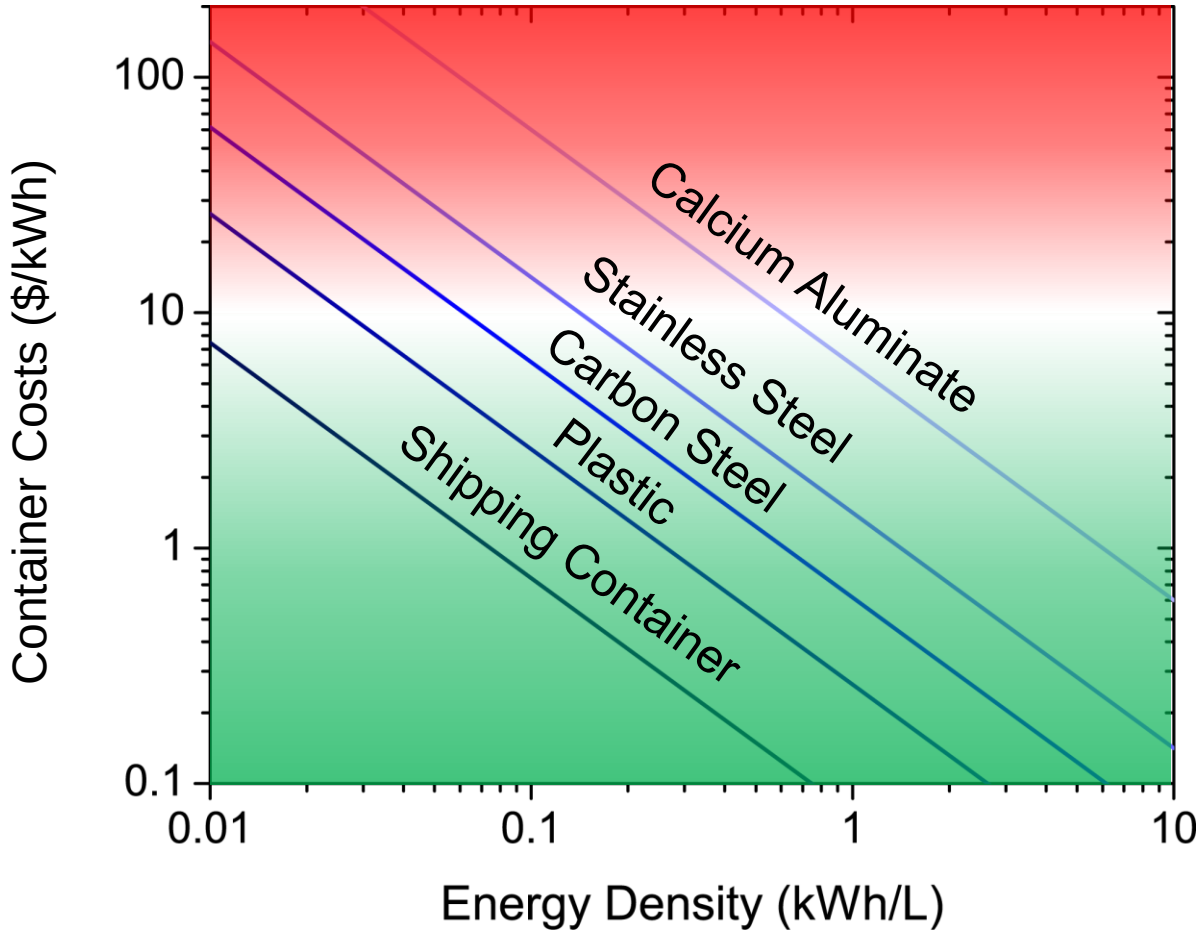


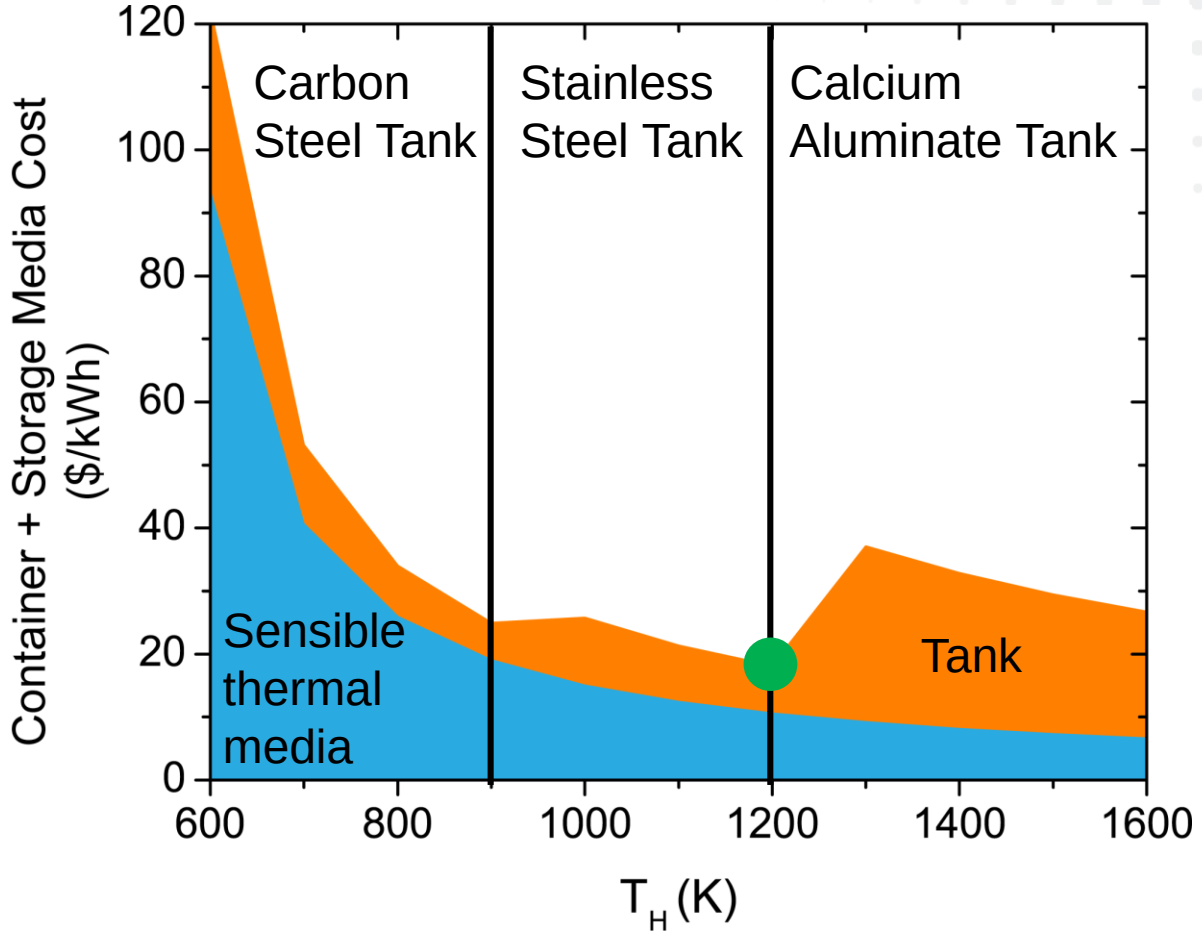
Energy storage medium cost and specific energy



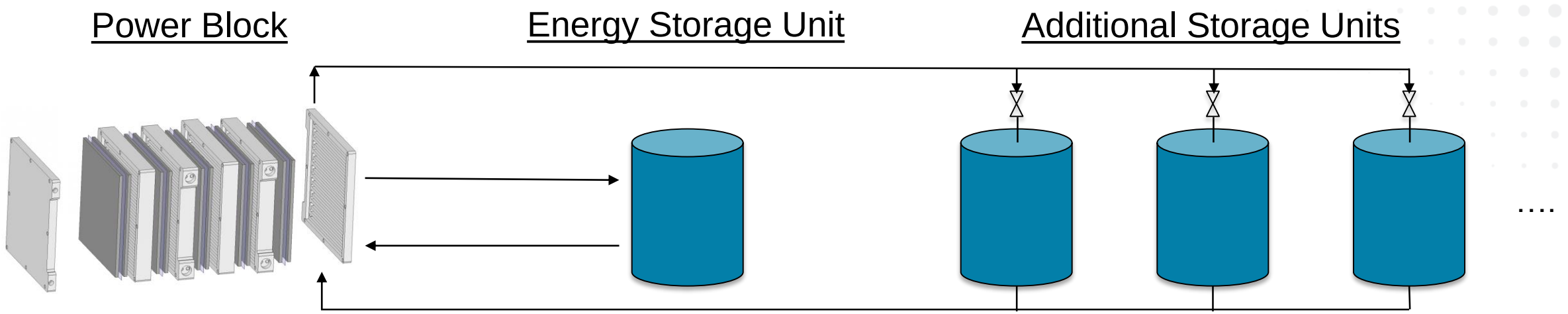
*Materials characteristics only.

Considerations for containerization

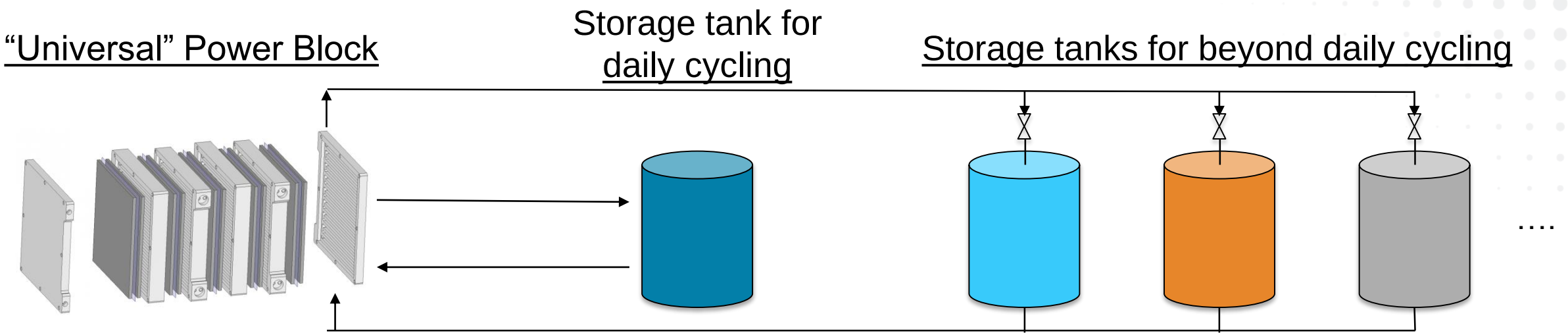




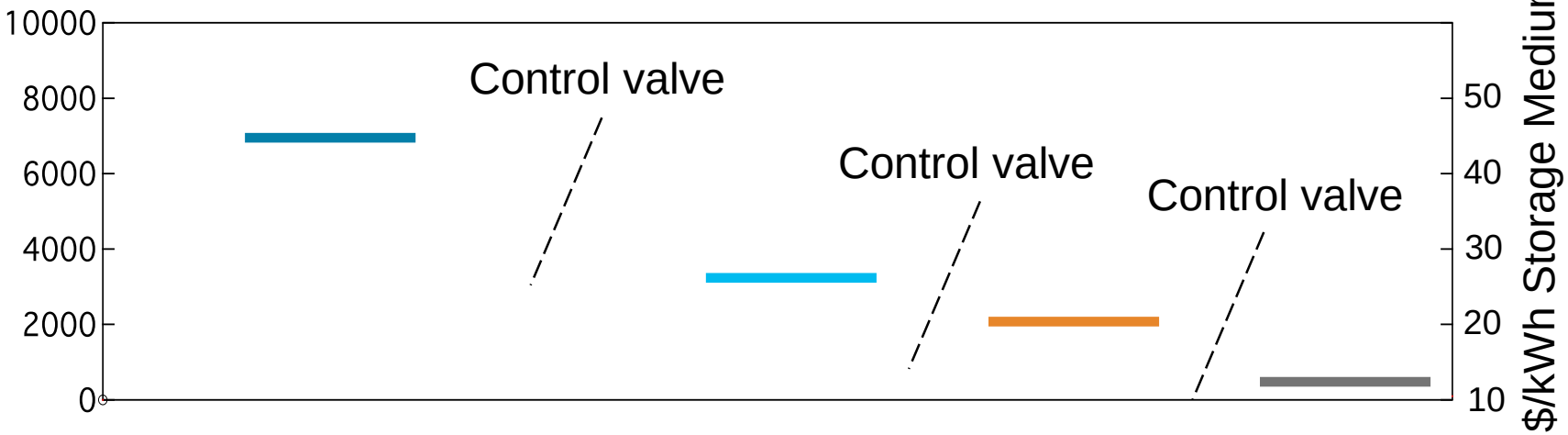
New energy scaling paradigms for long duration



New energy scaling paradigm: variable cycle life

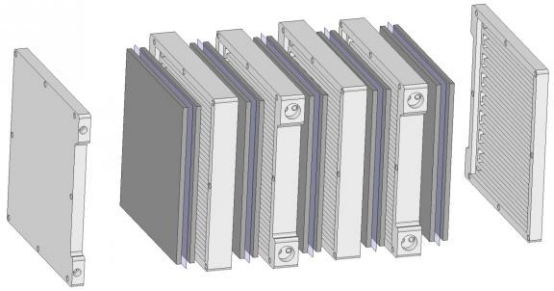


Cycles over 20 y

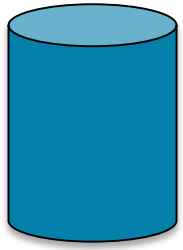


New energy scaling paradigm: variable energy density

Power Block

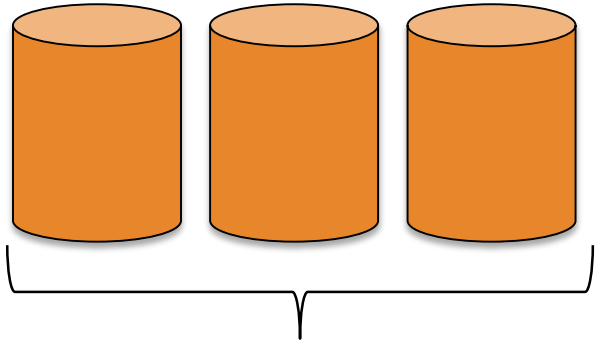


Storage tank for daily cycling



Fully dissolved reactants, 15 Wh/L

Storage tanks for beyond daily cycling



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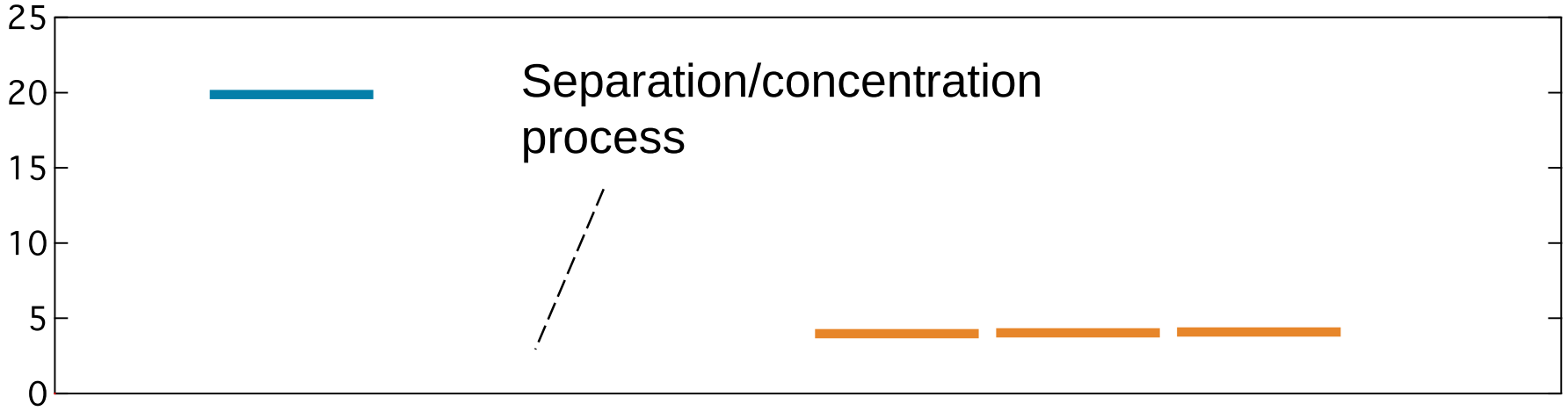
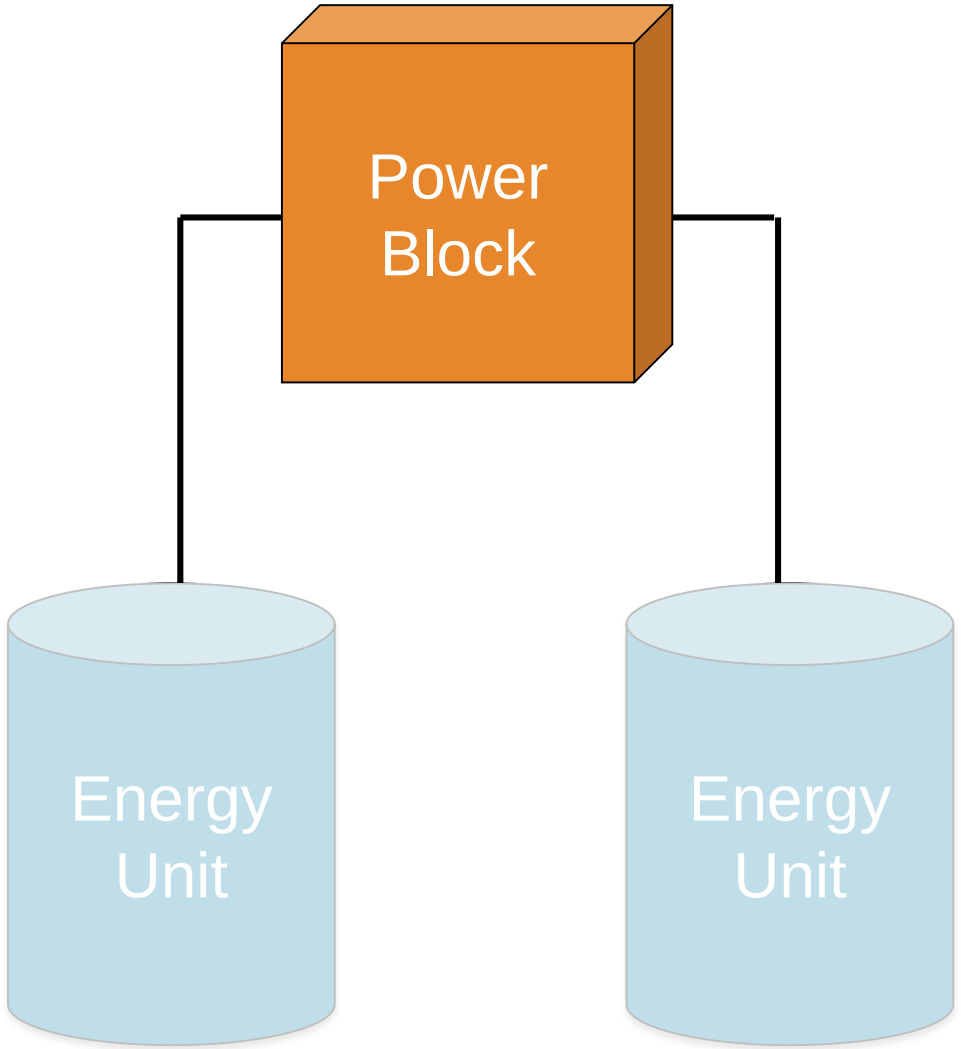
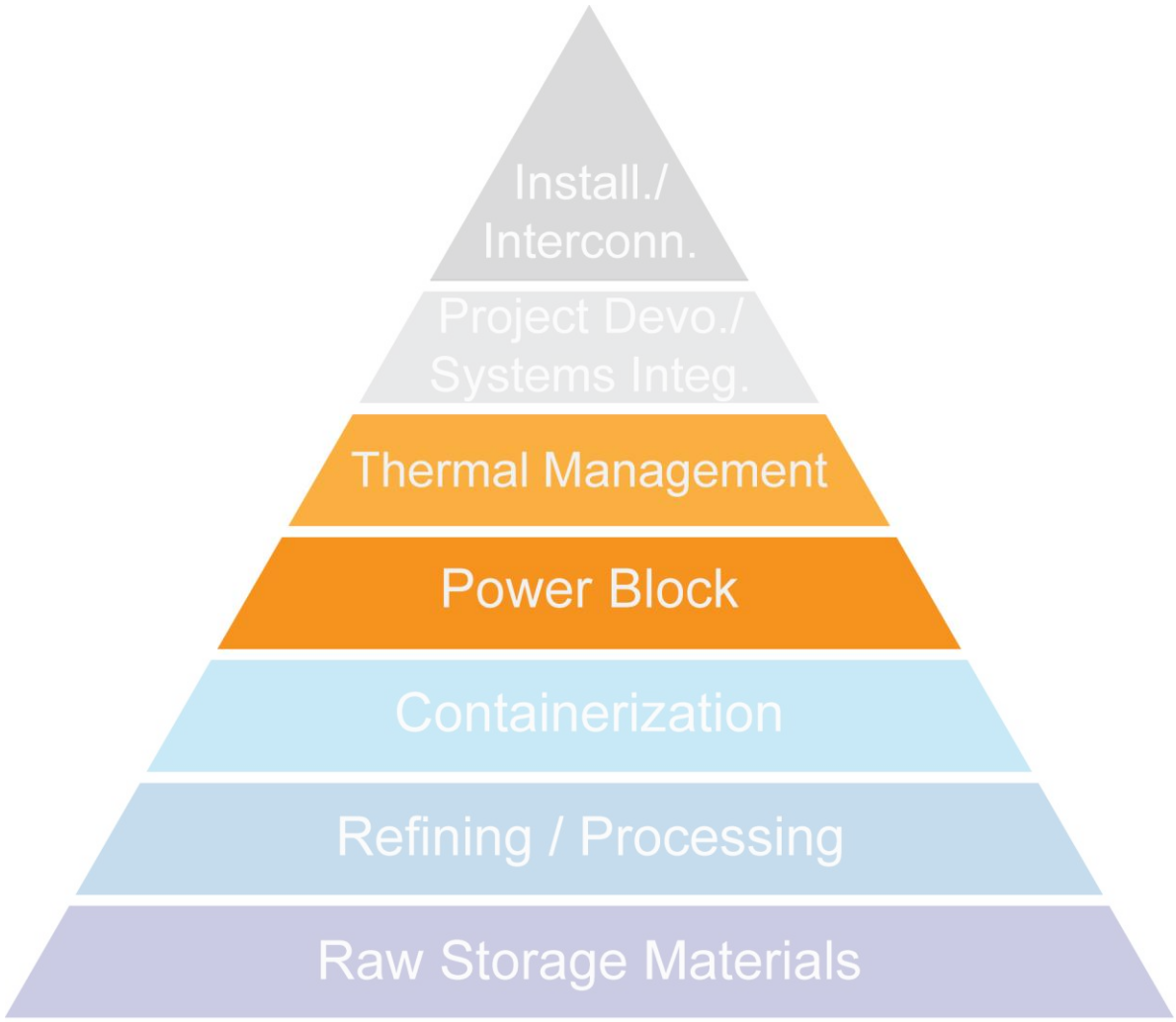
Concentrated reactants, >100 Wh/L

Container + Media Cost ($/kWh)

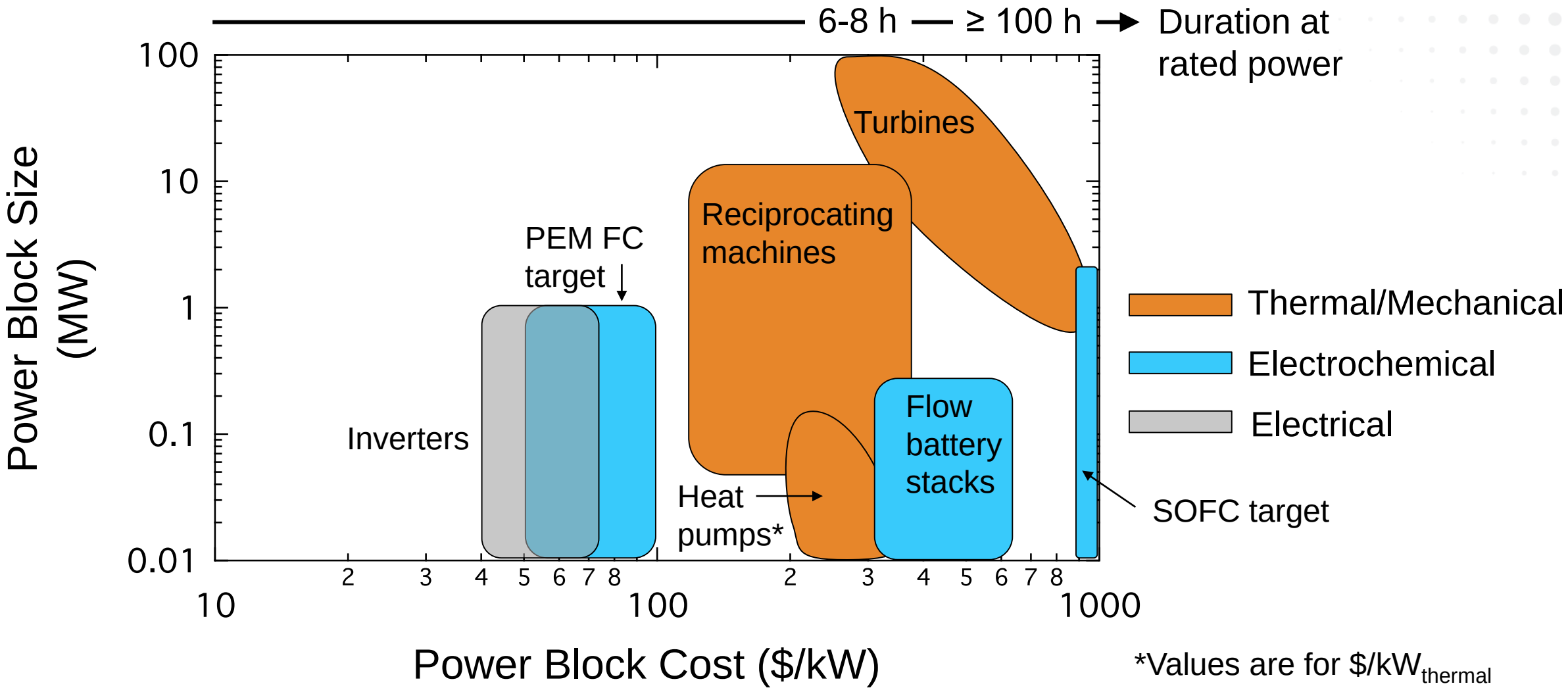


Components of energy storage: Power





Power block options at various scales and below $1/W



Boyce, M. P. Gas Turbine Engineering Handbook. 2nd Ed. 2002

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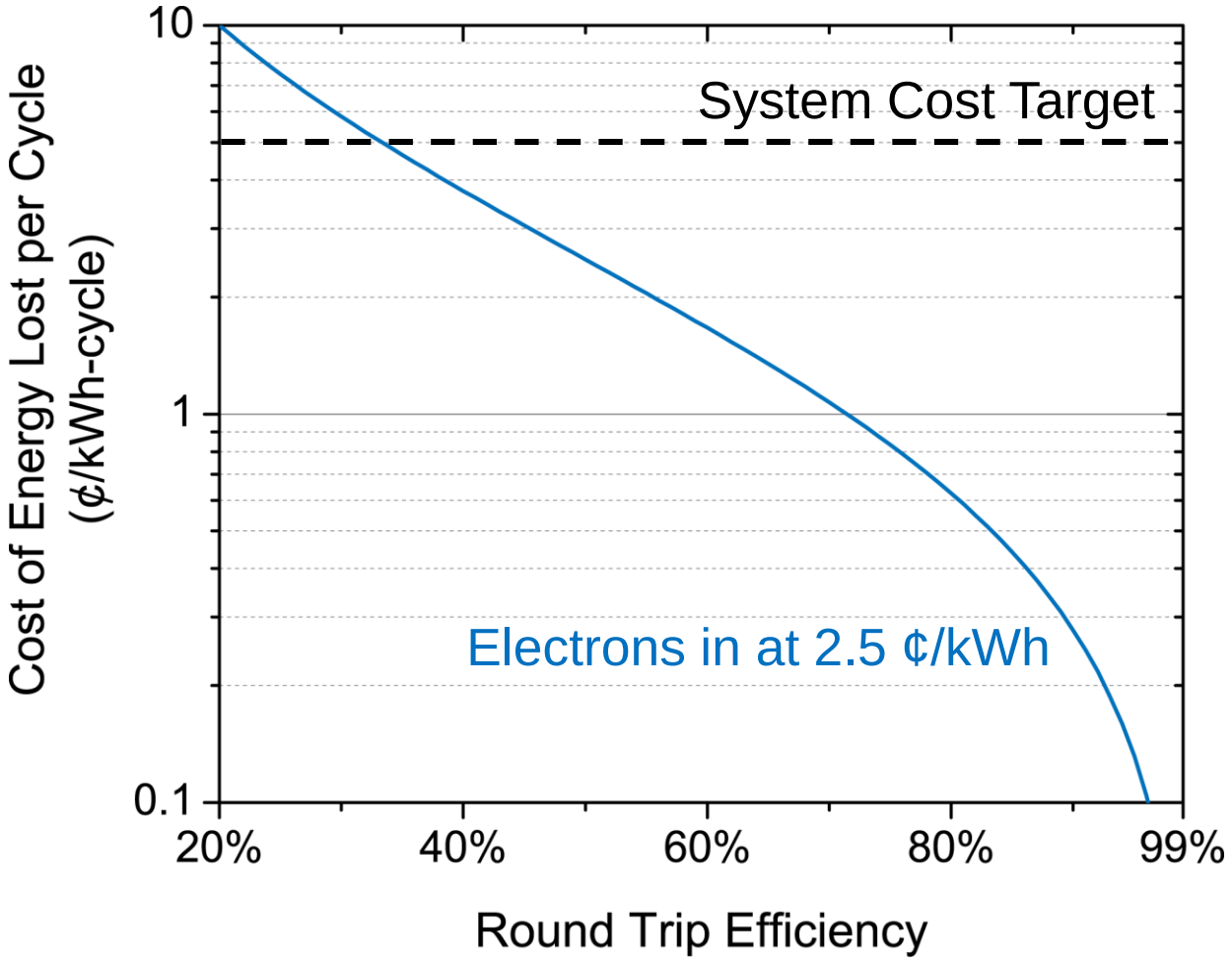
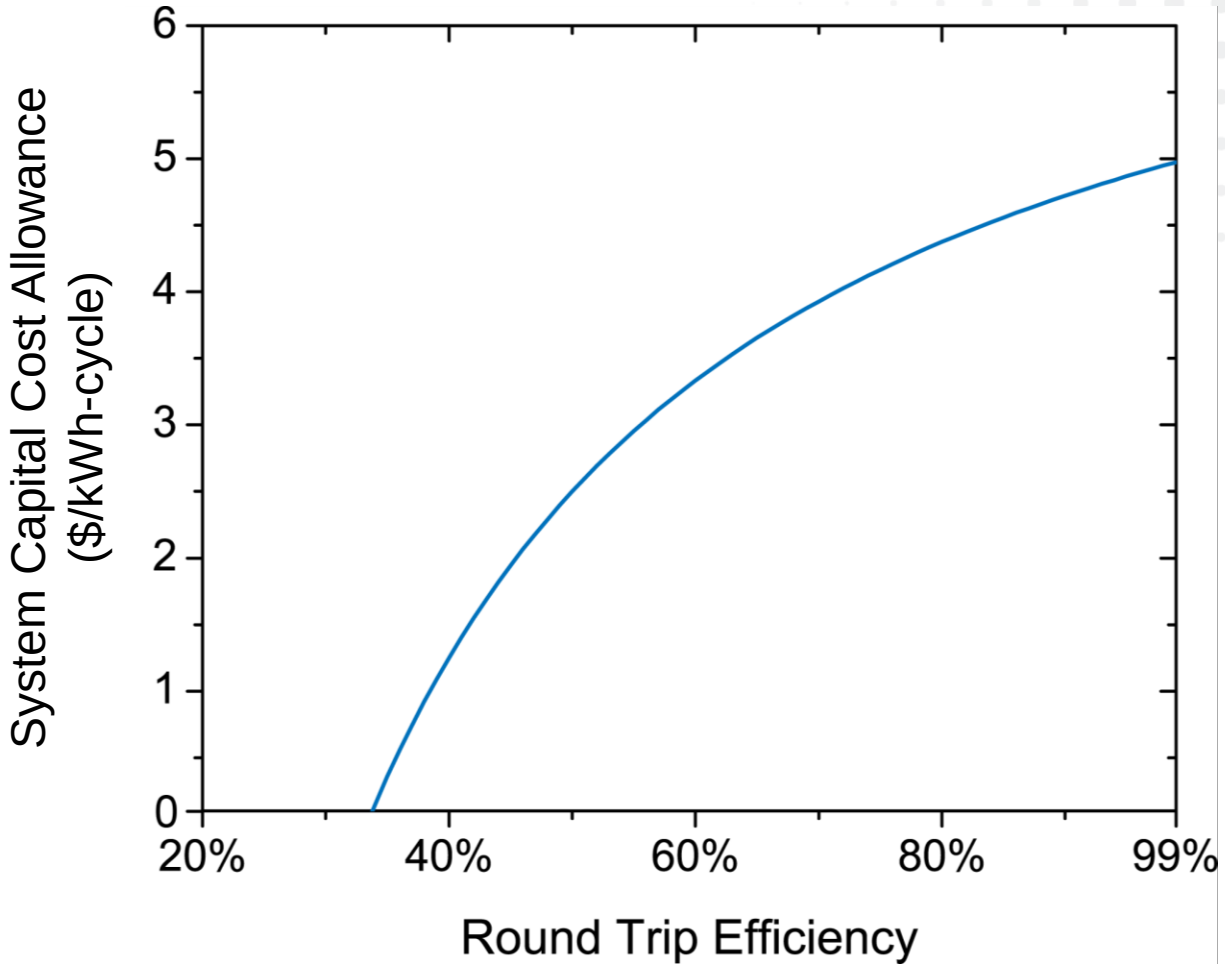
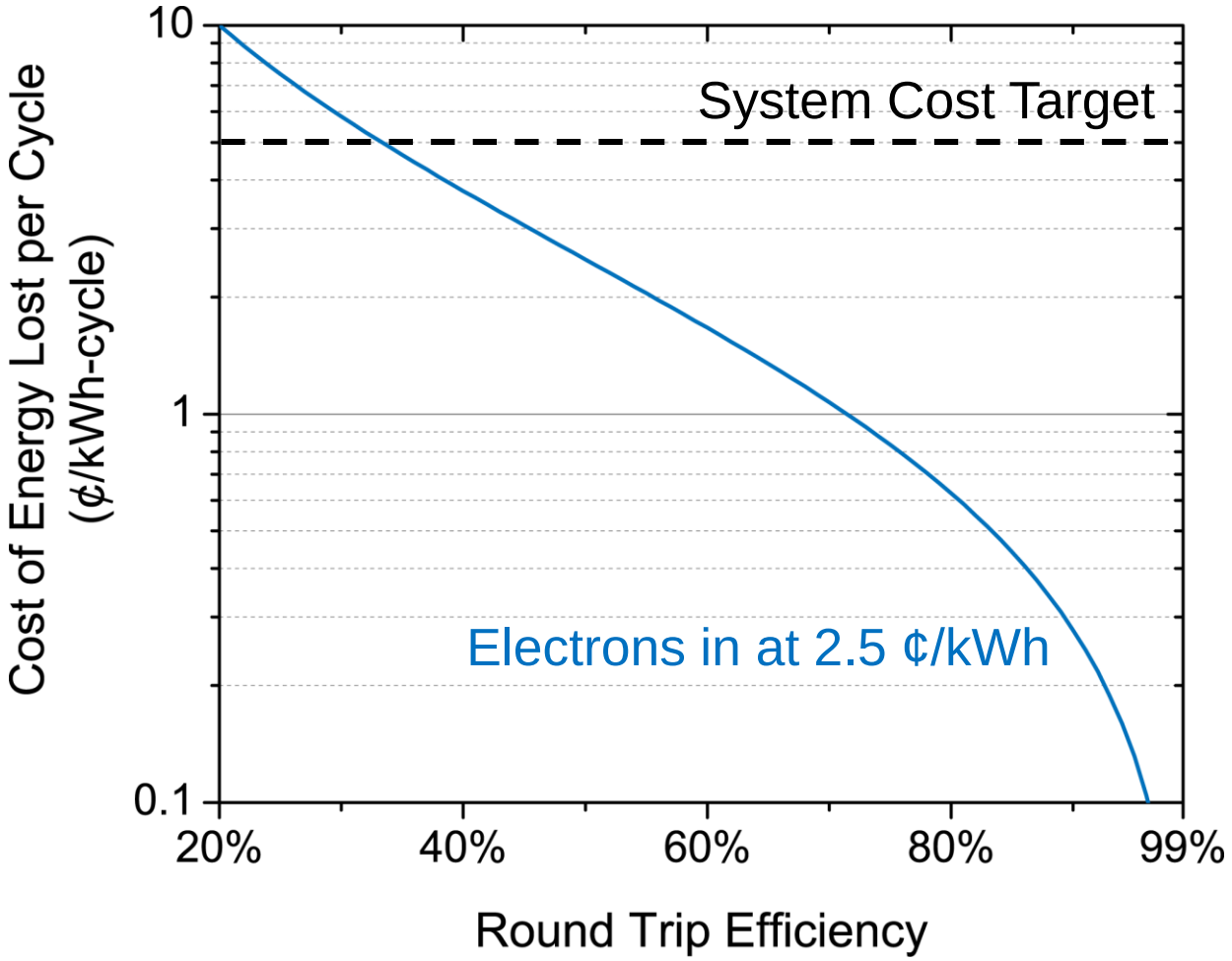
Low round trip efficiency limits the budget for capital costs

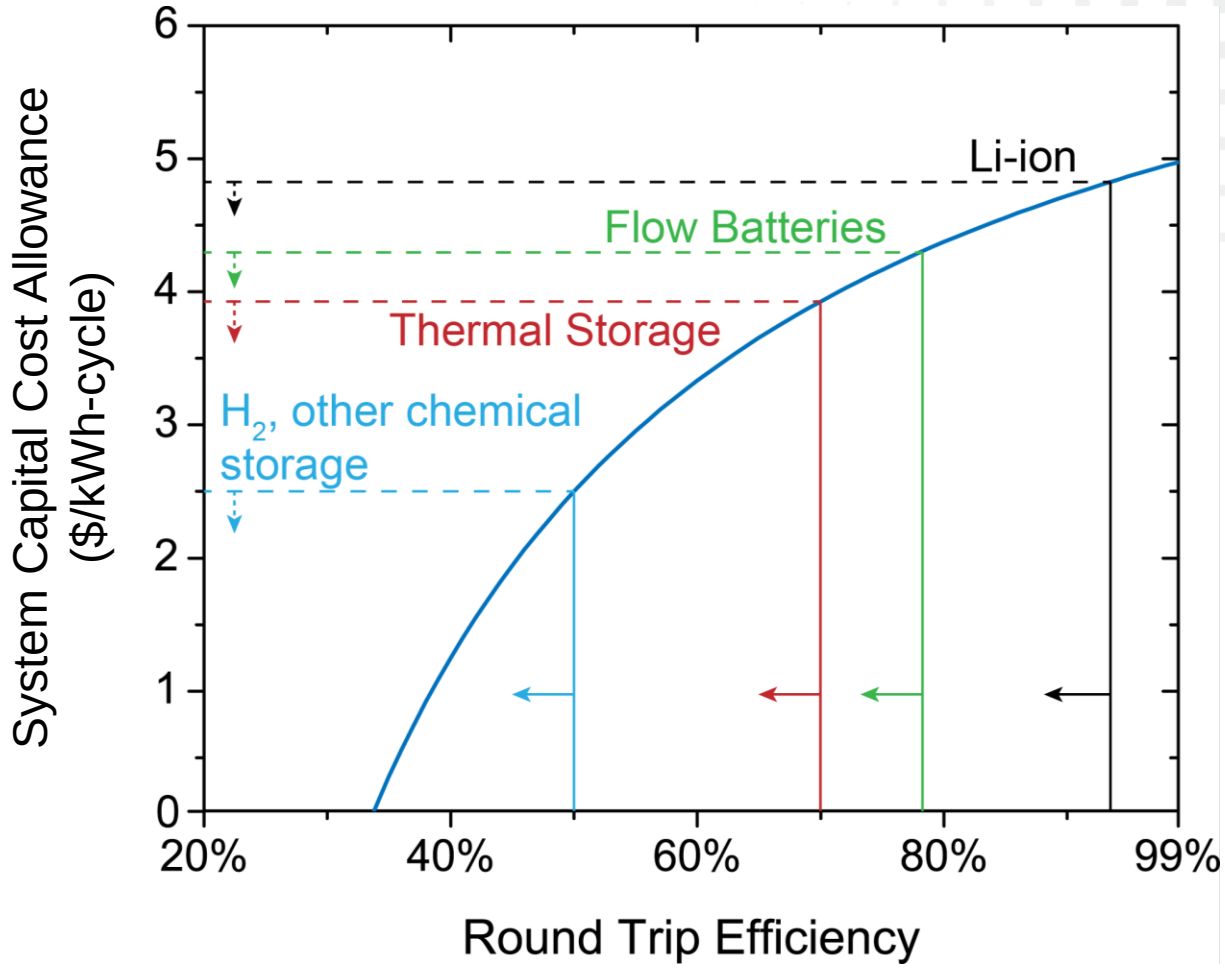




Charge price = 2.5 ¢/kWh; Discharge price = 7.5 ¢/kWh

Low round trip efficiency limits the budget for capital costs





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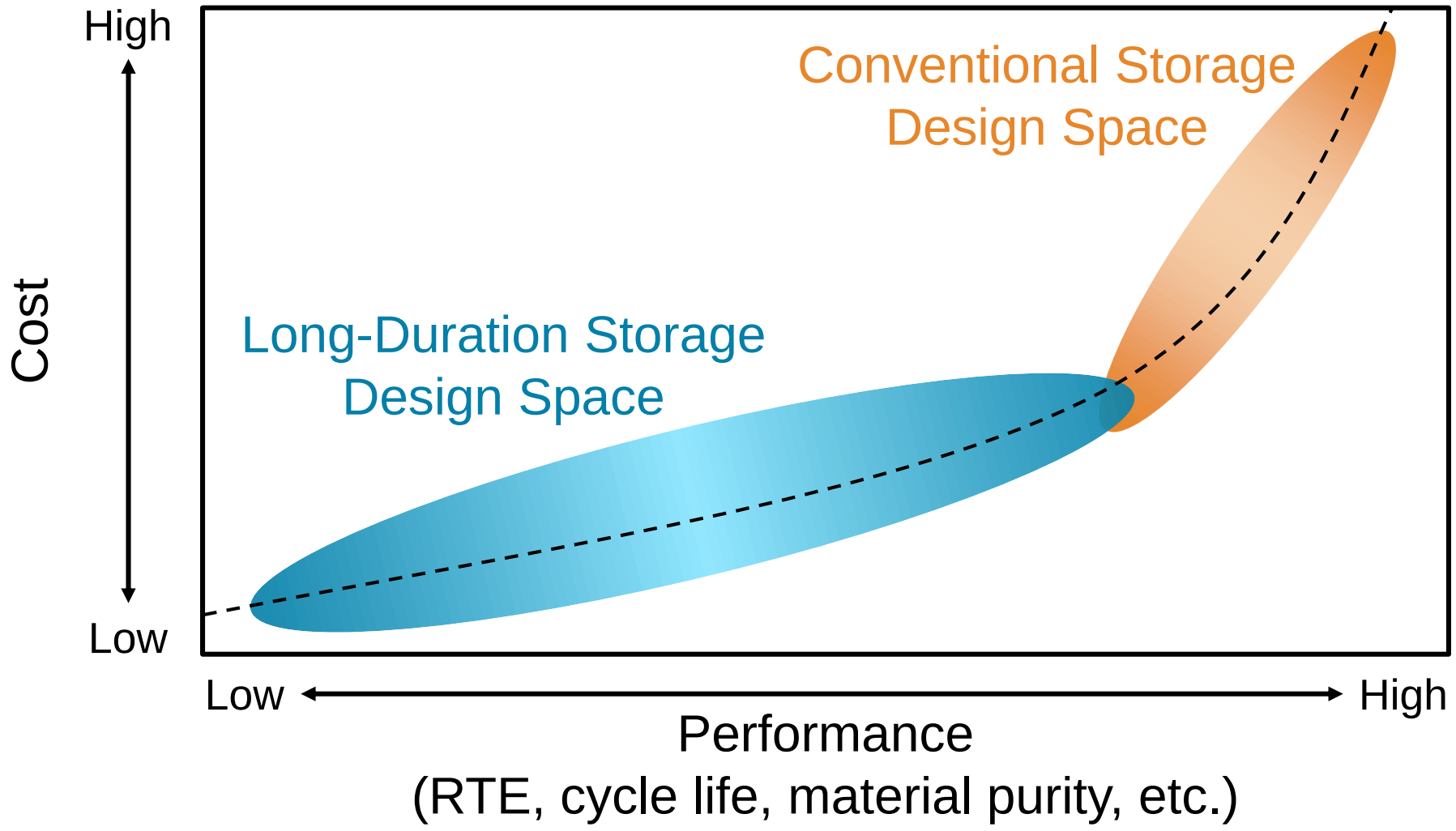
A fundamental shift in cost-performance tradeoff



Thank you

- Long-duration storage is an area of active program development

- We would like your feedback and ideas to enable cost-effective long-duration energy storage
  - We're particularly interested in innovative approaches that can:
    1. Dramatically reduce energy-related costs
    2. Fundamentally shift the cost/performance scaling of today's state-of-the-art systems

- ARPA-E workshop on long duration storage (held Dec. 7-8, 2017)
  - www.arpa-e.energy.gov/?q=workshop/long-duration-stationary-energy-storage

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